REMARKS

Claims 1-4, 6-10, 13 and 14 stand rejected under 35 U.S.C. § 112, second paragraph. This rejection is respectfully traversed for the following reasons.

With respect to claims 1, in order to expedite prosecution, the phrase --in capacity percent-- has been inserted after "hydrogen" in line 10 thereof. Claim 1 is submitted to be definite for the same reasons discussed below regarding claim 4.

With respect to claim 4, the Examiner alleges that "capacity percent" is not understood. However, this allegation is respectfully traversed. The Examiner is directed to col. 13, line 34 of Sugiura et al., which uses the same terminology so as to evidence that "capacity percent" has a known meaning in the art such that one of ordinary skill in the art would readily recognize the mete and bounds of claim 4, rendering claim 4 definite under § 112, second paragraph.

With respect to claim 2, in order to expedite prosecution, the term "rate" has been deleted and claim 2 is now submitted to be definite. With respect to claim 6, though Applicants' believe the Examiner's position is improper, similarly to claims 1 and 2, it is submitted that the amendment thereto renders the claim definite.

Based on all the foregoing, it is submitted that claims 1-4, 6-10, 13 and 14 are definite. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 112, second paragraph be withdrawn.

Claims 1-4, 6-10, 13 and 14 stand rejected under 35 U.S.C. § 103 as being unpatentable over Sugiura et al. in view of Keller. Claims 1, 7 and 9 are independent. This rejection is respectfully traversed for the following reasons.

In imposing a rejection under 35 U.S.C. §103, the Examiner is required to point to "page and line" wherein an applied reference is perceived to identically disclose ***each*** feature of ***each***

claim. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984). In the instant case, it is respectfully submitted that the Examiner has not identified where the cited prior art discloses each of the claimed features set forth in each of the pending claims. The Examiner merely refers to ***general*** disclosure of Sugiura and Keller regarding semiconductor processing, but does not identify where the prior art discloses specifically, among other things, "wherein the hole carrier concentration of said p-type nitride semiconductor layer decreases ***during said cooling process***" (emphasis added). The cited prior art appears completely silent as to such a feature, and the Examiner is likewise completely silent as to how the prior art is being interpreted to read thereon.

Turning to the cited prior art, Sugiura merely discloses the conventional processing (as set forth on pages 2-3 of Applicants' specification) for obtaining a nitride based semiconductor element of low resistivity by using nitrogen as a main carrier gas during the growth and cooling process of a p-type semiconductor. That is, Sugiura disclose only that GaN film doped with magnesium indicates a desired p-type conductivity or an undesirable high resistivity depending on the gas condition ***at the time of growth***. Sugiura is completely silent as to the effects of the gas condition at the time of cooling, and provides no motivation to experiment thereabout. Indeed, as set forth in Comparative Examples 1 and 2, a high resistance is obtained even when nitrogen is used as a main carrier gas in place of hydrogen at the time of cooling.

Keller, on the other hand, discloses only a step of cooling a p-type semiconductor in a hydrogen-free atmosphere so that there is no increase of resistance (inactivation of p-type impurities) with respect to films produced where hydrogen is fetched into the film in the cooling process. Accordingly, there is no disclosed need or desire for selectively reducing the hole

carrier concentration. Indeed, Keller discloses the possibility of omitting post-annealing for inactivating the p-type which become inert after their growth. It is respectfully submitted that such disclosure can reasonably suggest that inactivation of p-type impurities in a hydrogen-free atmosphere would increase hole carrier concentration.

In contrast, only Applicants have discovered the needed relationship between process parameters to conceive of a process to overcome the deficiencies of the prior art so as to produce low resistance semiconductors. As shown in Figure 5 of Applicants' specification, presence of hydrogen in the atmosphere in the cooling process reduces the hole carrier concentration in the substrate temperature range of 950°C - 600°C, and especially in the range of 950°C - 700°C. In view of Applicants' discovery, Applicants invented a process whereby hydrogen concentration in the temperature range and the residence time of a p-type semiconductor in the atmosphere are controlled to manufacture a p-type nitride semiconductor of low resistance which overcomes the deficiencies of the low-resistance semiconductors of the prior art.

The Examiner is reminded that "inherency may not be established by probabilities or possibilities", *Scaltech Inc. v. Retec/Tetra*, 178 F.3d 1378 (Fed. Cir. 1999). As mentioned above, the cited prior art is completely silent as to processing such that a "hole carrier concentration of said p-type nitride semiconductor layer decreases ***during said cooling process***" recited in claim 1. Further, with respect to claims 7 and 9, the cited prior art is completely silent as to controlling parameters "where the p-type nitride semiconductor layer has a hole carrier concentration of approximately $1 \times 10^{16} cm^{-3}$ or higher at room temperature".

The Examiner is directed to MPEP § 2143.03 under the section entitled "All Claim Limitations Must Be Taught or Suggested", which sets forth the applicable standard:

> To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (citing *In re Royka*, 180 USPQ 580 (CCPA 1974)).

In the instant case, the pending rejection does not "establish *prima facie* obviousness of [the] claimed invention" as recited in claims 1, 7 and 9 because the proposed combination fails the "all the claim limitations" standard required under § 103.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1, 7 and 9 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also patentable. In addition, it is respectfully submitted that the dependent claims are patentable based on their own merits by adding novel and non-obvious features to the combination.

For example, the Examiner's allegation that the values recited in the pending claims are obvious through routine experimentation, which necessarily relies on the well-known case law of *In re Aller*, is improper. That is, to allege that discovering an optimum or workable range by routine experimentation involves only routine skill in the art is improper because the Examiner has not established that any one of the optimized values is a result effective variable. The Examiner is directed to MPEP § 2144.05(II)(B) under the heading "Only Result-Effective Variables Can Be Optimized", which sets forth the applicable standard when applying *In re Aller*:

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. (citing *In re Antonie*, 195 USPQ 6 (CCPA 1977)).

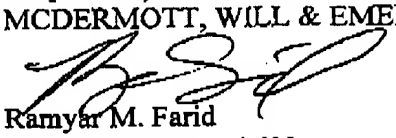
The Examiner has not indicated where the cited prior art shows the optimized values achieve a recognized result. Because the cited prior art as relied on by the Examiner does not recognize any achieved results, pursuant to the cited MPEP section above, optimum or workable ranges of the values can NOT be characterized as routine experimentation.

Based on all the foregoing, it is submitted that all pending claims are patentable over the cited prior art. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

Having fully and completely responded to the Office Action, Applicants submit that all of the claims are now in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below. To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,
MCDERMOTT, WILL & EMERY



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